

AMENDMENTS TO THE CLAIMS

Listing of Claims:

The listing of claims below replaces all prior versions of claims in the application.

1. (Withdrawn): A mapping-projection-type electron beam apparatus for observing and/or evaluating a surface of a sample by irradiating the sample with a primary electron beam and causing reflected electrons emitted from the sample to form an image on a detector, said apparatus comprising:

an electron impact-type detector such as an electron impact-type CCD and an electron impact-type TDI as said detector for detecting the reflected electrons, said detector capable of selectively detecting the reflected electrons on the basis of an energy difference between the reflected electrons and secondary electrons emitted from the sample.

2. (Withdrawn): An electron beam apparatus as claimed claim 1, further comprising an image processing mechanism for processing the output of said electron impact-type detector to produce an image for evaluation and inspection, wherein a gain of said electron impact-type detector and an amount of exposure of the image for evaluation and inspection are adjusted by changing the energy of the primary electron beam incident on the sample.

3. (Withdrawn): An electron beam apparatus as claimed in claim 1 or 2, wherein the energy of the primary electron beam incident on the sample is 2 to 4 keV thereby charging the

Application No.: 10/543,151
Art Unit: 2881

Amendment under 37 CFR §1.111
Attorney Docket No.: 052886

surface of the sample negatively so as to reduce image distortion due to charge-up on the surface of the sample.

4. (Withdrawn): An electron beam apparatus as claimed in claim 1 or 2, wherein the landing energy of the primary electron beam on the sample is set to 0.2 to 4.0 kV thereby improving an S/N ratio by detecting said reflected electrons and backscattered electrons.

5. (Withdrawn): An electron beam apparatus as claimed in claim 1 or 2, further comprising cooling means for cooling the electron impact-type detector to reduce heat generated due to electron bombardment.

6. (Currently amended): An electron beam apparatus for irradiating a sample surface placed in a sample chamber with a primary electron beam so as to evaluate the sample surface on the basis of a secondary electron beam emitted from the sample surface, the apparatus comprising:

a first electron source for generating the primary electron beam;

a cover for forming the sample chamber to cover the sample and having at least one gas inlet;

a device configured to supply means for supplying a gas through the at least one gas inlet into the sample chamber so as to uniformly cover the sample surface, charge-up on the sample surface being reduced by contact between the sample surface and the gas; and

a second electron source provided separately from the first electron source and capable of irradiating the sample surface with electron.

7-8. (Canceled)

9. (Currently amended) An electron beam apparatus as claimed in claim ~~[[8]]~~ 6, wherein the second ~~[[said]]~~ electron source ~~provided separately from the primary electron source~~ radiates electrons at an energy level of 2 to 4 keV.

10. (Currently amended) An electron beam apparatus as claimed in claim ~~[[8]]~~ 6, wherein the second ~~[[said]]~~ electron source ~~provided separately from the primary electron source~~ is of a carbon nanotube-type cold cathode electron source.

11. (Withdrawn): A method of manufacturing a semiconductor device, comprising a step of evaluating a wafer in the course of processing, by using the electron beam apparatus according to any one of claims 1, 2, 6 or 7.

12. (Currently amended) A method of evaluating a sample surface by irradiating the sample surface with a primary electron beam so as to evaluate the sample surface on the basis of a secondary electron beam emitted from the sample surface, the ~~[[said]]~~ method comprising: a step of

providing a first electron source for generating the primary electron beam;
providing a cover for forming the sample chamber to cover the sample and having at least
one gas inlet;
supplying a gas through the at least one gas inlet into the sample chamber so as to
uniformly cover the sample surface, so as to neutralize the sample surface negatively charged up,
the pressure of the supplied gas being in a range of 0.01 to 0.1 Pa with charge-up on the sample
surface being reduced by contact between the sample surface and the gas; and
providing a second electron source separately from the first electron source, the second
electron source being capable of irradiating the sample surface with electron.

13. (Currently amended) A method as claimed in claim 12,
wherein the pressure of the supplied gas is in a range of 0.01 to 0.1 Pa and wherein the gas
introduced into the sample chamber is one selected from a group comprised of nitrogen, water
vapor, a halogen gas having high affinity to electron and a chemical compound thereof.

14. (Currently amended) A method as claimed in claim 12 or 13, wherein ~~an electron~~
~~source other than a generation source for the primary electron beam is prepared; the sample is~~
~~irradiated with electrons from the electron source; the sample surface is thereby charged up~~
~~negatively;~~ the charge-up on the sample surface is neutralized by the supplied gas[[;]] and
wherein evaluation of the sample surface by means of the primary electron beam is thereafter
performed.

Application No.: 10/543,151
Art Unit: 2881

Amendment under 37 CFR §1.111
Attorney Docket No.: 052886

15. (Previously presented) A semiconductor device manufacturing method comprising performing water evaluation at an intermediate stage in the process by using the sample evaluation method according to claims 12 or 13.